



Preconception Counseling for Adolescents and Young Adults with Diabetes: a Literature Review of the Past 10 Years

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Abstract

Purpose of Review Women with diabetes who have unplanned pregnancies and uncontrolled blood sugars are at a higher risk for maternal and fetal morbidities and mortalities. Preconception counseling (PC) has been shown to decrease the risks and improve health outcomes. From 2009 to 2017, the American Diabetes Association has recommended that preconception counseling be given at each clinic visit for all women with diabetes of childbearing age starting at puberty (prior to sexual debut).

Recent Findings This article reports both national and international progress in PC efforts for adolescents and young adults (12–34 years) with diabetes over the past decade. Twenty-eight publications were identified and included in this article (11 were research, 12 clinical guidelines, and 5 reviews).

Summary Despite recommendations to start PC at puberty, only four studies had interventions that targeted the adolescent and young adult age group. Three of them were associated with the same PC awareness program. Positive outcomes were reported in all of these studies. Greater family vigilance was observed in a long-term follow-up of a cohort of women who received PC as teens. Adolescents should receive awareness PC. More early PC interventions and cohort follow-up studies are needed among adolescents and young adults, using technology that appeals to this age group. Programs should be expanded to include other populations like males with diabetes and females from other cultures and religions that would require program modification.

Keywords Preconception counseling · Reproductive health · Diabetes · Adolescents · Young adults · Female

Introduction

Diabetes is a leading cause of prenatal and neonatal complications and one of the most prevalent severe and costly chronic diseases [1, 2]. In childbearing women, uncontrolled diabetes (DM) can have major negative outcomes on reproductive health [1, 2]. Uncontrolled diabetes and unplanned pregnancies have caused severe pregnancy-related complications and

morbidity and mortality in the offspring of women with both type 1 diabetes (T1D) and type 2 diabetes (T2D) [3••]. The risk of the complications can be diminished with preconception counseling and care.

Preconception counseling and care is standard management for all women of reproductive age with DM, beginning at puberty, to prevent unplanned pregnancies and plan future pregnancies that are safe and wanted [3••]. Personalized counseling and care is recommended to achieve tight metabolic control at conception and throughout the pregnancy for optimal fetal and maternal outcomes and to prevent complications [3••]. Despite these recommendations, two out of three pregnancies in women with DM are unplanned [4].

Moreover, there has been an increase in the rates of pregnancies among women with pre-existing diabetes. Their prevalence of pregnancies has doubled for young women and increased fivefold for adolescents between 1999 and 2005 in the USA [5]. The adolescent period poses an additional risk, whereby adolescent women are at higher risk of pregnancy-related complications [6]. Furthermore, evidence has shown

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that metabolic control and adherence to diabetes management have been more difficult to achieve during adolescence [7, 8], further compounding the problem.

Preconception counseling (PC) can be conceptualized and delivered in three phases: (1) awareness counseling for all women to learn how to prevent an unplanned pregnancy and the importance of planning a pregnancy, (2) overview of PC care for women contemplating becoming pregnant, and (3) in-depth assessment and personalized recommendations and care for women who are actively planning a pregnancy [9]. Traditionally, preconception counseling has been primarily directed toward women who are in the overview and in-depth phases. However, recently, the 2017 American Diabetes Association (ADA) ‘Standards of Medical Care’ guidelines has included the awareness phase, particularly for teens with DM who are at a high risk for unplanned pregnancy [3•]. Recommending that “starting at puberty, PC should be incorporated into routine diabetes care” was highlighted in both the “Children and Adolescents” and the “Management of Diabetes and Pregnancy” sections of the guidelines (S106 and S114) [3•]. The awareness phase includes information regarding the following: (1) importance of tight metabolic control before conception, (2) diabetes and pregnancy/risk of complications, (3) how to have a healthy pregnancy, (4) importance of planning a pregnancy with PC, (5) how to prevent an unplanned pregnancy, and (6) family planning advice [9]. Awareness phase can include a reproductive health plan to define the patient’s goals for current and future childbearing goals. Sexual activity should be reviewed at every visit with appropriate anticipatory guidance given [10].

The efficacy and cost-effectiveness of preconception counseling and care have been well-supported through independent research and clinical practice in preventing unplanned pregnancy, enhancing knowledge, and preventing adverse outcomes [11, 12]. When delivered as recommended, during every clinical visit, preconception counseling and care has been shown to decrease maternal and fetal complications [2, 3•, 12, 13]. Patients garner the greatest benefit by receiving preconception care from a multi-disciplinary team of specialists, including certified DM educators, physicians, nurse practitioners, registered nurses, and dietitians.

In the USA, the two standard guidelines for preconception counseling and care for women of childbearing age with DM are the ADA [3•] and the American Congress of Obstetricians and Gynecologists (ACOG) [14]. While these two organizations have a shared goal of lowering the risk of complications for women with DM of childbearing age, their guidelines differ slightly. The ADA recommends that preconception counseling efforts should be initiated for all adolescents and young women of childbearing age beginning at puberty [3•] and there are developmentally appropriate

preconception counseling programs available for free endorsed by the ADA [15]. The ADA contends the importance of glycemic control maintenance to as close to a normal range as is safely possible, with an ideal goal of glycosylated hemoglobin (HbA_{1C}) < 6.5% (48 mmol/mol) [3•]. In addition, the ADA recommends fasting glucose levels of ≤ 95 mg/dL (5.33 mmol/L) and either a 1-h postprandial ≤ 140 mg/dL (7.8 mmol/L) or a 2-h postprandial ≤ 120 mg/dL (6.7 mmol/L) [3•]. The ACOG also supports the importance of preconception counseling for decreasing adverse outcomes and mandates that HbA_{1C} should be < 6% with a fasting plasma blood glucose levels of < 95 mg/dL [14]. In addition to strict HbA_{1C} control, the ACOG supports an optimal 1-h postprandial of < 140 mg/dL and a 2-h postprandial of < 120 mg/dL [14]. Guidelines such as these [3•, 14] have set standards for studies regarding PC interventions.

Literature Reviews on Preconception Counseling for Adolescents and Young Adult Women

Preconception counseling (PC) was a key feature in only five literature reviews on reproductive health-related topics in women with diabetes that were written in this past decade [16•, 17, 18]. All reviews were written by international authors. Four reviews focused primarily on overall preconception care for women with diabetes [18, 19]. Only one review specifically targeted adolescents with diabetes [10], with a focus on contraception and pregnancy in adolescents with T1D [10]. Although this article did not address the full scope of preconception counseling or care, it did address one of the main components of awareness counseling, namely, family planning and contraception targeting teens.

An overall paucity of education to prevent pregnancy in adolescents with T1D was noted across these reviews. This may be explained by ambivalent attitudes of HCPs recommending contraceptives to teens with diabetes, or that HCPs may have inadequate training in PC or sexual education, or their uncertainty to what age to begin PC [10, 20]. Overall, previous reviews concluded that preconception counseling and care are effective in reducing the risk of pregnancy-related complications in women with diabetes and improving maternal and fetal outcomes [18, 19], while one noted the importance of a PC program for adolescents with T1D [10].

This current review serves as an update to a previously published article in 2008 by Charron-Prochownik et al. [21]. We included articles that focused on preconception counseling (emphasizing the awareness phase), rather than preconception care (emphasizing the overview and in-depth assessment phases). We placed high importance on articles that focused on preconception counseling efforts for adolescents (ages 12–24) and young adults (ages 25–34) [22].

Methods

We conducted an extensive review of the literature published between January 2008 and October 2017 to examine current literature on preconception counseling for adolescents and young adults with DM. Our search criteria used PubMed MESH terms “Diabetes Mellitus, Type 1,” “Diabetes Mellitus, Type 2,” “Preconception Care,” “Pregnancy Complications/prevention and control,” “Family Planning Services,” “Contraception,” and “Sex Education” for articles that were published in English within that time frame.

A total of 163 citations were retrieved. Relevant articles were independently selected by two researchers in a blind review and were not shared with one another until they compared selections and until consensus was reached. These results were then further evaluated by three additional members of the research team, differences between reviewers were resolved by discussion, and final conflicts were resolved with the assistance of the senior author (DC-P). Out of 163 total articles, 23 publications were agreed upon (11 research studies and 12 clinical guideline articles). Research studies are summarized in Supplemental Table 1. Nine publications came from within the USA and 14 were from international sources. Articles were selected if preconception “counseling” was noted as an independent variable in original research articles or as a main concept that was measured in a review or clinical article. Preconception “care” only articles were not selected since they reflected the overview and in-depth phases for women actively planning pregnancies. We identified those articles that focused on the PC awareness phase, which is appropriate for all adolescents and young adult women with diabetes who are not eminently planning a pregnancy.

Recent Findings

Preconception Counseling Research (Across All Age Groups)

A total of 11 original research articles were selected based on our inclusion criteria outlined above for preconception counseling. Seven articles were quantitative studies using interventional and/or comparative designs [11, 23–26, 27•, 28]—of those, three were randomized controlled trials (RCTs) with three data collection time points [11, 26, 28], two were one-group quasi-experimental pre-post design [24, 25], one was a long-term cohort follow-up study which compared adult women who received a PC intervention as teens with a matched comparative group who did not receive it [27], and one was a prospective comparative [23]. Four were qualitative designs exploring patient and/or provider experiences [29–32].

Interventions consisted of providing preconception counseling and education [11, 24–28]. The methods of delivery varied from face-to-face counseling by an obstetric healthcare expert with distribution of educational literature [24]; a home-delivered preconception counseling DVD that aimed to increase awareness of pregnancy planning in all women of childbearing age with DM [25]; and a computer-based PC program (CD, DVD) with a book targeting teens and enhancing the awareness phase of preconception counseling to prevent unplanned pregnancies and reproductive health complications [11, 26–28].

Only two PC programs were theory-driven, “READY-Girls” [11, 26, 27•, 28] and “Women with Diabetes: Things you need to know” [25]. Both used the Expanded Health Belief Model (EHBM). The dimensions of the EHBM were adapted to measure adolescents’ perceived susceptibility and severity of unplanned pregnancies and pregnancy-related complications; benefits and barriers to seeking preconception counseling and using effective family planning; motivational cues and social support; and intentions and behaviors of seeking preconception counseling, using effective family planning to prevent unplanned pregnancies, and initiating discussions with HCPs [33, 34]. Holme’s theoretical framework and the Reproductive Health Attitudes and Behavior (RHAB) questionnaire [35] were adapted from Charron-Prochownik’s research program [34, 36, 37].

All of the intervention studies reported improved awareness and knowledge among women. Some found positive changes in self-reported beliefs and attitudes and intentions regarding PC, diabetes, and RH [11, 25, 26, 28]. Only Charron-Prochownik and colleagues (2010, 2013, and 2016) examined teens’ initiating discussion about PC and RH with HCPs and found that teens who received the PC program were significantly more likely to initiate discussion [11, 27, 28]. Only Fischl and colleagues (2010) examined resource utilization and cost, and they found that PC intervention was cost saving at \$18 per participant. Of note, none of the articles reported pregnancies as an outcome.

READY-Girls was the only program [11, 26, 27•, 28] described as being specifically targeted to adolescents with diabetes. Moreover, other articles that featured a high percentage of adolescent and young adult participants did so due to the age range of the sample cohort [24, 25] rather than tailoring a PC program specifically to adolescents’ developmental and educational needs. Therefore, while the results of our review showed that some of these programs were being utilized by adolescents and young women with DM, it is notable that few intervention programs were specifically designed for this population.

Preconception Counseling Programs for Adolescents and Young Adult Women

In this section, we further describe a subgroup of the studies mentioned above, to focus on adolescents and young adults.

Five studies described early preconception counseling interventions for adolescents and young adults (12–34 years old) with DM [11, 24, 26, 27•, 28]. The most common outcomes measured were (1) knowledge [11, 24, 26, 27•, 28], (2) awareness of preconception counseling [11, 24, 26, 27•, 28], (3) beliefs and attitudes [11, 26, 27•, 28], (4) intentions and behaviors regarding diabetes and pregnancy, sexuality, and seeking preconception counseling [11, 26, 27•, 28], (5) initiating discussion [11, 26, 27•, 28], (6) use of effective family planning [11, 26, 27•, 28], (7) resource utilization and cost [11], and (8) preferred method of RH program delivery [24]. Post-intervention, all studies found an increase in knowledge and awareness [11, 24, 26, 27•, 28]; in addition, some studies found positive changes in attitudes and intentions regarding seeking preconception counseling and family planning behavior [11, 26, 27•, 28].

The Reproductive-health Education and Awareness of Diabetes in Youth for Girls (READY-Girls) program was awareness PC targeting adolescents. It was originally developed at the University of Pittsburgh by Charron-Prochownik and her team of researchers (Charron-Prochownik et al. 2001) in 2001 and was subsequently revised [15, 35, 37–40]. This developmentally appropriate, theory-based, and validated preconception counseling program, which increases knowledge and promotes positive health beliefs and attitudes, is based on the Expanded Health Belief Model [33] and focuses on teaching adolescent females with DM (ages 13–22) about the effects of DM on reproductive health and pregnancy, the importance of seeking preconception counseling, and seeking preconception care when planning pregnancies, the importance of effective family planning methods, and initiating discussion regarding these topics with both HCPs and family members to optimize outcomes [15, 37, 38]. In addition to providing awareness PC, a unique and important feature of READY-Girls is that the RH information is specific for teens with diabetes (such as how diabetes affects puberty, hormonal changes, sexual activity, pregnancy, and risk to sexual transmitted disease). The READY-Girls PC program was modified for adolescents with T1D and T2D (Denise Charron-Prochownik et al. 2013). Notably, the READY-Girls research team found in a 15-year follow-up study of a current cohort of 53 adult women who received READY-Girls as teenagers and compared them with adult women who had not received the intervention, that those who had early PC as teens were more family planning vigilant, such as having significantly used more effective BC, and initiated discussion with HCPs more often [27•].

Sapiano and colleagues (2010) evaluated a PC educational interventional program in the form of a talk by an obstetric gynecologist expert and the distribution of educational literature among 37 Maltase women with T1D of reproductive age (12–30 years) [24]. There was no detailed information about the content or development of the educational program.

Results of a pre and post self-administered questionnaire related to DSM and PC indicated increased knowledge and awareness. The preferred source to learn about PC was doctor/specialists, followed by books, magazines, leaflets; then internet and diabetes clinic staff; lastly standard media such television and radio.

Qualitative Research on Experiences of Diabetes and Preconception Counseling in Adolescents and Young Adult Women

Two qualitative articles in the past decade explored the experiences of patients with diabetes reflecting on when they were contemplating or actively planning pregnancies [30, 31]. None of these articles specifically addressed issues or needs of adolescents and young adults. Many of the women who participated in these studies did not receive PC. Their lack of awareness and knowledge of diabetes and pregnancy, and lack of communication with HCPs were reflected in their comments. For some of the women who did receive components of PC, only negative information was heard, with “no positive information given” [30]. While one of the components of preconception counseling is to raise awareness about the complications that can occur during a pregnancy, a few women said that the information they did receive evoked anxiety [30, 31]. Anxiety was discussed in relation to the complexity of childbearing decisions [30, 31], and on the health of the pregnancies, the child, and the patient’s own health [30, 31]. Another common theme that emerged was lack of communication from HCPs [31, 41].

Authors concluded that HCPs who provide usual DM care are well-positioned to provide advice and support to women about becoming pregnant, tailoring the education to the needs of the individual and taking into account the psychological well-being of the woman [30]. In addition, findings underscored the importance of having a familiar relationship between the HCP and the woman so that the providers can provide individualized care and advice [31].

Perspectives of Healthcare Professionals on Preconception Counseling in Adolescents and Young Adult Women

Two qualitative studies of HCP participants were reviewed. One study was conducted in the USA, using a focus group and mental model approach with nine HCPs who were experts in diabetes, adolescence, PC, and RH issues to summarize their knowledge and experience with these topics. The HCPs in this study recommended providing a developmentally appropriate and culturally sensitive PC program to adolescents with T2D [29]. This recommendation was based on several factors such as the rise in T2D rates among adolescents particularly from minority groups (i.e., African American, Native American,

and Hispanic) as well as the unique needs of adolescents with T2D (e.g., different treatments from T1D, obesity), and the higher risks of severe complications of uncontrolled diabetes among this population.

The second study was conducted in the United Kingdom where semi-structured interviews were conducted with 8 general practitioners (GPs) and 7 diabetes specialists to elicit their perceptions regarding the GP's vital role in delivering preconception counseling to women with diabetes [32]. The HCPs who took part in this study recommended developing guidelines and protocols to integrate PC into primary care setting to ensure the continuity of care and preparing women with T2D for pregnancy. In addition, raising awareness among GPs of the need for PC to women with diabetes and providing training and resources was emphasized.

Both groups of researchers recommended beginning PC at puberty and at every visit for women with diabetes of childbearing age [29, 32]. Downs and colleagues (2010) emphasized tailoring a PC program specifically to adolescents with type 2 diabetes (T2D). Mortagy and colleagues (2010) reported on the importance of general practitioners (GP) providing preconception counseling for women with diabetes, starting at puberty, in the primary care setting.

Preconception Counseling Clinical Guideline Articles for Adolescents and Young Adult Women

The importance of preconception counseling (PC) was a key feature in 12 clinical guideline articles on reproductive health-related topics in women with diabetes written in this past decade [42–53]. Despite the ADA recommendations mentioned above that “...Starting at puberty, preconception counseling should be incorporated into routine diabetes care for all girls of childbearing potential.” [3•], and which first appeared in the 2008 ADA Guidelines [3•, 4], only three clinical guideline articles highlighted the importance of preconception counseling beginning at puberty [42, 49, 52]. However, the unique counseling needs of adolescent and young adults with diabetes given in the awareness phase of PC were not addressed in these three articles.

Conclusions

The goals of preconception counseling have remained consistent throughout the past 10 years. They include (1) the introduction and regular reinforcement of personalized preconception counseling and pregnancy planning for adolescents and young women with DM, (2) the empowerment of the patient to seek, receive, and utilize preconception counseling and care to delay and plan a pregnancy until it is safe and desired, and (3) the facilitation of a close partnership with the healthcare team. Notably, the 2017 ADA Standards of Medical Care in

Diabetes emphasized the importance of starting awareness preconception counseling during puberty in both DM care in pregnancy and in DM care of children and adolescents with diabetes [3•].

Despite recommendations to start PC at puberty, evidence from qualitative studies with women and healthcare providers indicates that it is rarely discussed [10, 31, 32]. These findings were consistent with other qualitative studies among diabetic adolescents and their mothers with HCPs [54], and among adult women with T1D and T2D [41].

Regarding interventions, only five studies had programs that targeted the adolescent and young adult age group [11, 24, 26, 27•, 28]. Four of them were associated with the same PC awareness program (READY-Girls) developed for adolescents [11, 26, 27•, 28]. This PC awareness program is the only one that has been modified for adolescents with T1D and T2D [28]. Positive outcomes, including increased knowledge and self-efficacy, stronger positive health beliefs, and initiating discussion with HCPs, were reported in all of these studies. Greater family vigilance was observed in a long-term follow-up of a cohort of women who received PC as teens [27•]. More research is also needed to evaluate the best delivery of PC along with examining methods to encourage women to utilize it [16•]. More RCTs with longer follow-up periods are needed to assess the effects of PC in women with diabetes on health outcomes, or support any particular protocol of PC over another [16•].

The non-research clinical guideline articles reviewed here highlight the importance of providing PC in routine care of women with diabetes (e.g., Fleming and Corbett 2010; Hitman 2014; Kalra, Gupta, and Kalra 2015; Modder 2008; Helen R. Murphy 2016) [52, 55–58]. Yet, only three of the 12 clinical guideline articles highlighted the importance of preconception counseling beginning at puberty [42, 49, 52]. Furthermore, these three articles did not mention the specific counseling issues of adolescents and young adults with DM which should be given during the awareness phase of PC.

In the past decade, considerable progress has been made in providing preconception counseling and care in international countries. Countries in Europe and other regions of the world showed progress in the implementation of preconception counseling in the routine care of women with diabetes. However, only a few of these articles specifically addressed issues or needs of adolescents and young adults.

More emphasis is needed on providing awareness PC to all adolescents and young adults with diabetes. Awareness PC has been shown to be effective on RH outcomes and have a low-cost utilization [11]. In addition to providing facts about preventing uncontrolled diabetes in pregnancy, preconception counseling programs should also target positive attitudes and promote health beliefs that may influence optimal reproductive health behaviors. The U.S. READY-Girls research team originally used the Expanded Health Belief Model as the theoretical framework

for this PC program in 1999 and have been conducting a series of RCTs [11, 26, 27•, 28] to validate and modify the program according to the changing needs of adolescents with diabetes. Findings in this review revealed that other research teams have adapted this model along with our RHAB measures and have included this in their programs [25]. Since the last review, elements of the READY-Girls program have been adopted and tested in Europe [25]. Results support previous READY-Girls findings [11, 26, 28] that an educational DVD intervention significantly increased patients' perceived benefits of preconception counseling and contraceptive use, as well as increased knowledge and self-efficacy regarding contraception use and preconception care access [25].

Targeting positive attitudes and promoting positive health beliefs may also help to alleviate anxiety that some women experienced while receiving PC [30, 31]. Rather than withholding this information, efforts should be made in regards to the content, timing, method of delivery, while considering the developmental and cultural relevance of PC when tailoring it to the individual needs of each woman.

Because PC has been shown to decrease pregnancy-related complications from 9 to 2% [2], evidence-based information on PC must be provided in a positive and proactive way instilling hope rather than fear. Information on "the complications that can occur during a pregnancy" must be immediately followed by strategies to decrease this risk and the importance of tight metabolic control to empower adolescents and young women to plan for healthy pregnancies in their future. PC should also emphasize the importance of the team approach to relieve the burdens from the "complexity of childbearing decisions" and enhance "communication between HCPs" and the woman with diabetes [31]. These findings emphasized the importance of HCPs, especially diabetes educators, physicians, nurse practitioners, and nurses to consider the woman's psychological well-being and be proactive and sensitive when providing accurate information, with appropriate timing, wording, and developmentally appropriate delivery in a way to minimize anxiety. The HCP must focus on empowering the patient through preconception counseling and care to promote planned pregnancies that are safe. Women should be told that with the support of their healthcare team, they can control their blood sugars to prevent complications.

However, not all healthcare providers feel confident or competent with providing preconception counseling to their adolescent and young adult female patients with DM, or HCPs may not consider providing PC to this age group [59]. Other provider barriers include being too busy in the clinical setting, personal discomfort, especially when the patient is very young, or institutional policies that prevent providers from presenting this information [10, 21, 59]. Providing HCP training and resources is warranted. Certified Diabetes Educators are specifically trained to deliver diabetes self-management information and can be especially helpful in providing PC.

Adolescents and young adults continue to represent a highly vulnerable group to unplanned pregnancies and poor reproductive health outcomes. The enhanced knowledge, family planning strategies, and increased self-efficacy from preconception counseling also underscore the importance of developing culturally- tailored and developmentally appropriate preconception counseling interventions for groups who may be at a higher risk for developing DM, such as Latinas [54, 60–64], American Indians/Alaska Natives [65], and other at-risk groups. These populations are also vulnerable to GDM and T2D, which requires additional information specific to the treatment and prevention of those conditions [65, 66]. Furthermore, programs designed specifically for adolescents and young adults should include the roles of support networks, such as mothers or other female relatives, that may help the young woman to feel encouraged in and to increase the efficacy of these programs.

Although some qualitative evidence indicated that preconception counseling materials were not taken seriously or were skimmed over by adolescents [67], other evidence suggests that women with diabetes who received preconception counseling as teenagers had positive reproductive health outcomes such as delaying sexual debut, initiating preconception counseling-related conversations with their healthcare providers, and increased use of more effective contraceptives [27•]. While few adolescents are likely to plan their pregnancies, enhanced awareness by giving information and promoting the importance of pregnancy planning in the future may help to optimize patient outcomes and prevent adverse outcomes when pregnancy is safe and desired. Thus, all adolescents and young adult women with T1D and T2D should receive awareness PC.

Future Directions

This review examined articles from the past decade relating to preconception counseling for adolescents and young adults with DM. Although we focused on females, there is a notable dearth of information regarding preconception counseling programs directed toward males of reproductive age with DM, or females from other cultures and religions, such as Muslim adolescents and young adults, that would require program modification. Teams of researchers are beginning to investigate the needs of adolescent males with diabetes and RH counseling [68]. Culturally tailored diabetes-related PC programs are being developed for American Indian and Alaska Native adolescents and their mothers [65, 69] and for the Latina population [54, 60, 61]. Additionally, the mode of program delivery is important. Programs should consider e-health options to utilize technology that is acceptable and accessible by adolescents and young adults. Information must be given as boosters rather than one session [28]. And for adolescents,

HCPs should elicit the support of the girls' mothers, and provide skills that will empower the teens to initiate discussion regarding reproductive health with the healthcare team [26, 28]. However, more studies of early interventions to provide awareness counseling and long-term cohort follow-up studies are needed among the adolescent and young adult age group. While progress has been made to support preconception counseling and awareness-enhancing strategies for women with diabetes of reproductive age, further research is needed to best identify and address the unique needs of adolescents and young adults.

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Compliance with Ethical Standards

Conflict of Interest Frances Peterson-Burch, Hiba AbuJaradeh, Nicole Charache, Andrea Fischl, and Denise Charron-Prochownik declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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